V. Bianchi, C. Guerra, I. De Munari, P. Ciampolini. **Wearable sensors enabling AAL multi-user behavioral assessment.** *Gerontechnology 2016;15(suppl):5s*; doi:10.4017/gt.2016.15.s.899.00 **Purpose** In this paper, novel features introduced in the design of the wearable Multi Sensor Assistant (MuSA[1]) platform are discussed, underlining the pivotal role MuSA plays in the assisted living environments it is conceived for. In particular, we exploit MuSA to enable user-aware behavioral analysis based on environmental devices as well. **Method** MuSA is a tiny device, suitable for being worn at belt and embedding an Inertial Measurement Unit, an IEEE 802.15.4/ZigBee transceiver SOC, this in turn featuring a 8-bit microprocessor core. MuSA has originally been conceived for fall-detection purposes, and it is part of the CARDEA AAL system[2], where it plays a manifold role. It provides the system with many 'subjective' physical activity indicators: besides fall detection, qualitative indicators such as energy expenditure[3] and gait features can be extracted. By exploiting data fusion at the board level, data coming from the accelerometers and the magnetometer can be combined, providing reliable information both in dynamic and static conditions, allowing for posture estimation and low-level activity recognition. MuSA also acts an ID tag, being of course associated to a given user (among many possibly living in the same environment) and allows for tagging actions detected by environmental devices (e.g., a chair occupancy sensor). In principle, knowing the exact position of the wearable and environmental devices within a common map should easily account for such tagging. However, implementing accurate indoor (radio) geolocalisation techniques is a demanding task, both in terms of hardware needs (radio beacons) and of installation/calibration procedures. We therefore devised a simplified localization technique, requiring no additional hardware and little training. Basically, once a given sensor is fired, a nearest neighbour estimation is carried out, looking for the closer wearable device. It roughly estimate distances among dialoguing devices (based on received signal strength); then a classifier stage is exploited to cope with uneven EM propagation features within the home environment and (mostly relevant) with possibly misleading conditions, in which interaction comes from a non-tagged user (e.g. a caregiver). **Results & Discussion** The approach has been implemented and tested first in a lab environment (simulating a home) and performing systematic test to assess performances in a variety of scenarios. Accuracy well above 95% were obtained, which is more than adequate for behavioral profiling. Identification is being currently exploited at about 30 real homes, in the context of the AAL-JP project HELICOPTER[4] pilot experiments. *Figure 1*, shows a sample of 'tagged' environmental sensor data, coming from such experiment.

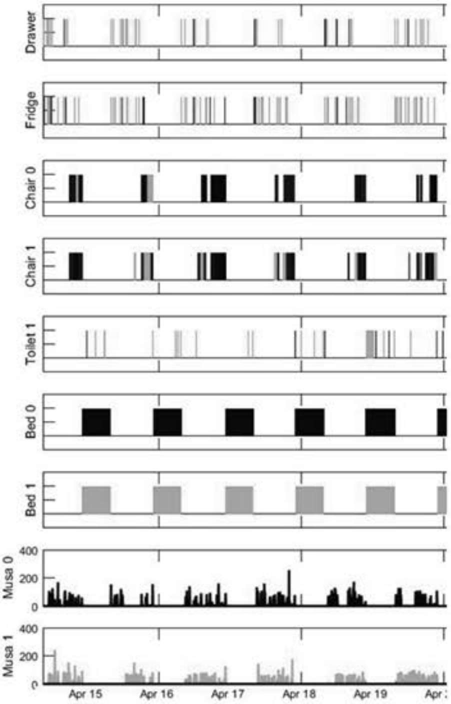

Figure 1: Environmental sensor data plot with tagging; actions attributed to user A are indicated in dark grey, to user B in light grey

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